# **Protocol A – Biochar Micro‑Plot Field Trial (Fall 2025)**

## **1 Study Objective**

Evaluate whether a 2 % w/w pine‑derived biochar amendment applied to a small urban vegetable bed:

* increases soil pH by ≥ 0.3 units,
* raises cation‑exchange capacity (CEC) by ≥ 10 cmol c kg⁻¹,
* reduces cumulative NO₃⁻ leaching by ≥ 25 %, and
* improves fresh‑biomass yield by ≥ 15 %

compared with a compost‑only control over a single 10‑week growing season.

## **2 Site & Layout**

* **Location** Berkeley co‑op vegetable bed (Zone 9b loam; 1 m × 2 m frame).
* **Experimental units** Eight micro‑plots, each **0.5 m × 1 m** (0.5 m²).
* **Design** Randomised Complete Block Design (RCBD) with two blocks; 25 cm soil buffer between blocks.

| **Block 1** | **Block 2** |
| --- | --- |
| B1 (biochar) | C3 (control) |
| C1 | B3 |
|  |  |
| B2 | C4 |
| C2 | B4 |

## **3 Treatments**

| **Treatment** | **Amendment** | **Rate** | **Application depth** |
| --- | --- | --- | --- |
| **Biochar** | Rinsed pine biochar (EC < 2 dS m⁻¹) | 2 kg m⁻² (≈ 2 % w/w) | Incorporated 0–15 cm |
| **Control** | None | — | — |

*All plots receive a uniform 2.5 cm layer of finished compost after incorporation.*

## **4 Crops & Planting Density**

* **Bush beans** 6 plants plot⁻¹ (rows 20 cm apart).
* **Leaf lettuce** 12 plants plot⁻¹ (rows 15 cm apart; edge 5 cm buffer unharvested).

## **5 Sampling Schedule**

| **Week** | **Activity** | **Analyses** |
| --- | --- | --- |
| 0 (Aug 2‑8) | Baseline composite soil sample | pH, OM %, CEC, NO₃⁻/NH₄⁺, Pb |
| 1, 3, 5, 7, 9 | Field readings | pH (1:1 slurry), EC, volumetric soil‑moisture (capacitance) |
| 2 & 6 | Lysimeter leachate (25 cm depth) | NO₃⁻ strip + smartphone RGB |
| 10 (Nov 3‑10) | Final harvest & post‑soil sample | Fresh & dry biomass; pH, CEC, NO₃⁻ |

## **6 Measurements & Methods**

| **Variable** | **Method** | **Instrument / lab** |
| --- | --- | --- |
| **pH** | 1:1 soil:H₂O slurry | Apera PH60S |
| **EC** | Same slurry | Apera PH60S (EC mode) |
| **Soil moisture** | 10 cm probe | Vegetronix VH400 |
| **CEC** | NH₄OAc extraction | Commercial soil lab (Alluvial) |
| **NO₃⁻ leachate** | Test strip + RGB calibration | Merck 1.10020; iPhone camera + Python script |
| **Yield** | Fresh mass with digital scale; 60 °C dry mass × 48 h | — |

## **7 Data Management & Statistics**

* **Logging** Google Sheet → weekly export to 02\_Data\_Templates/raw/.
* **Version control** GitHub repo Biochar\_Garden\_Project with Zenodo DOI.

## **8 Safety & Compliance**

| **Hazard** | **Control** |
| --- | --- |
| Biochar dust | N95 respirator; wet char before sieving |
| Dilute acids/bases (≤0.1 M) | Nitrile gloves, goggles, neutralise with 5 % NaHCO₃ |
| Lysimeter holes | Flag markers; back‑fill same day or cover with board |

SDS and one‑page Job Safety Analysis stored in 03\_Admin\_Safety/.

## **9 Timeline Snapshot**

| **Date** | **Milestone** |
| --- | --- |
| Aug 2 | Plot layout, biochar rinse, baseline soil shipped |
| Aug 15 | First leachate pull; dashboard live |
| Oct 1 | Mid‑season ANOVA check |
| Nov 3 | Final harvest; post‑soil sampling |
| Nov 15 | Stats complete; Zenodo DOI tagged |
| Jan 2026 | Submit 4 000‑word MS to *Currents* |

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